

REMARKS

The claims have been amended in order to more particularly point out, and distinctly claim the subject matter which the applicants regard as their invention.

The Office Action required that FIG. 4 be labeled "Prior Art". Accordingly, attached herewith is a replacement drawing sheet for FIG. 4 labeling it as prior art. Removal of the objection is respectfully requested.

The Office Action requested a more definitive title. Accordingly, the title has been amended to read "Scroll Compressor With Surface Processed Orbiting Scroll Plate Back Surface".

In the present amendment, Claim 1 is amended to incorporate the contents of original Claim 3. Claims 3-8 have been canceled. New Claim 9 has been added to recite masking the sliding portion between the back surface and the sealing ring (Claim 1 incorporating original Claim 4), and new Claim 11 has been added to recite removing by working the surface processing of the sliding portion between the back surface and the seal ring (Claim 1 incorporating original Claim 5). Applicants respectfully submit that no new matter is involved.

Independent Claim 1, as amended, is to a scroll compressor in which a scroll fixed lap rising from a fixed plate of a fixed scroll and a scroll orbiting lap rising from an orbiting plate of an orbiting scroll are combined with each other to form compression chambers therebetween. A plate back surface of the orbiting scroll is provided with a back pressure space, the back pressure space is divided into an inner region and an outer region by a seal ring, high pressure is applied to the inner region of the seal ring, and pressure which is lower than that applied to the inner region is applied

to the outer region, bringing the orbiting scroll into contact with the fixed scroll. A rotation-resistant part restrains the orbiting scroll from rotating, and the orbiting scroll is allowed to orbit, thereby moving the compression chamber toward a center of scroll while reducing volume of the compression chamber. Refrigerant gas is sucked into the compression chamber and compressed. The fixed scroll is made of iron-based material, the orbiting scroll is made of aluminum-based material, only the plate back surface of the orbiting scroll is subjected to surface processing, and at least a sliding portion between the plate back surface and the seal ring is subjected to lapping processing, buff processing or barrel polishing processing after the surface processing so as to provide reduced friction between the seal ring and the plate back surface.

In the Office Action, Claims 1 and 2 were rejected as obvious in view of a combination of Admitted Prior Art (APA) and Hirooka (U.S. 5,584,678); and Claims 3-8 as obvious in view of a combination of APA, Hirooka and Yamada (U.S. 5,468,130). Reconsideration and removal of these rejections is respectfully requested in view of the present claim amendments and the following remarks.

The Office Action asserts, with respect to Claims 1 and 2, that the APA teaches the present claimed scroll compressor except that it fails to show at least the plate back surface of the orbiting scroll being subject to surface treatment. Hirooka is then cited to show that it is known where at least the plate back surface of the orbiting scroll (14) is subjected to surface processing with any of alumite coating processing being carried out as the surface processing (col. 5, lines 59-61). It is then alleged that it would be obvious to have utilized the plate surface of the orbiting scroll being

subjected to surface processing, as taught by Hirooka in the APA apparatus, since the use thereof would have reduced the wear amount, and improved the performance and the efficiency of the scroll compressor device.

With respect to Claims 3 and 6, it is asserted that while modified APA fails to disclose a sliding portion between the plate back surface and the seal ring being subjected to lapping processing, buff processing or barrel polishing processing after the surface processing, a product-by-process limitation and the determination of patentability in a product-by-process claim are based on the product itself, even though the claim may be limited and defined by the process.

With respect to Claims 4 and 7, it is asserted that while modified APA fails to disclose a sliding portion between the plate back surface and the seal ring being masked and subjected to the surface processing, such is also a product-by-process limitation, and these claims are thus rejected as are Claims 3 and 6.

With respect to Claims 5 and 8, it is asserted that while modified APA fails to disclose a sliding portion between the back plate surface and the seal ring being removed by working, such is again a product-by-process limitation and does not lend patentability to the claims.

Applicants would point out that the Hirooka reference teaches surface treatment by an alumite treatment of the entire surface of a swivel scroll (14), as referred to at col. 5, lines 59-67 of the reference. Such surface treatment creates a surface roughness and the patentees solve the problem by use of a specific composition of a tip seal. Also, each of the swivel scrolls (14) and stationary scroll (10) can be aluminum with a surface treatment, a hard ferrous metal, or a ferrous

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metal having a surface treatment, contrary to the present scroll compressor where the fixed scroll must be iron-based material and the orbiting scroll is an aluminum-based material.

In the present specification, only the plate back surface of the orbiting scroll needs to be surface treated, which is much more economical than an overall surface treatment as provided by Hirooka.

Also, along with surface treatment of the plate back surface, various features are provided that reduce friction between the seal and the back surface. Claim 1 has been amended to include the limitations of Claim 3 to provide lapping processing, buff processing or barrel processing after the surface treatment.

The prior art fails to teach or suggest a scroll with only a plate back surface of an orbiting scroll, subjected to a surface treatment, with specific features that reduce friction between a seal and the back plate surface and thus do not require the specific seal materials of Hirooka.

The Yamada reference merely shows complete surface plating of a movable scroll with a two-layer specific plating and does not cure the deficiencies of Hirooka.


In view of the aforementioned amendments and accompanying remarks, Claims 1-2 and 9-11, as amended, are believed to be patentable and in condition for allowance, which action, at an early date, is requested.

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In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosure: Replacement Drawing Sheet FIG. 4